Van de Graaff Generator

2002-10-27

Some day I'd like to build a full scale Van de Graaff generator, but until I can find myself some good belts and spheres this little device will have to do. It is built using a coke can, an off-cut piece of drain tube, a $1.20 toy electric motor, a large rubber band, some waste timber bits, blu-tack, PVC electrical tape and de-soldering braid.

The coke can makes the main electrode. Ideally it should cover the top roller to shield it, but it works OK a few millimetres above it. It isn't the smoothest electrode and the charging current is quite feeble, but this isn't a precision electrostatic machine!

I started with thinner and smaller elastic bands, but they proved too fragile, the friction heats the rubber and destroys them quickly. The larger ones have their own challenges, the main one being that I cut the pipe off-cut too short for their larger diameter, having none left I had to chock up the tower a bit with some scrap timber wheels.

The motor is suspended across the tube with plastic ice cream sticks. The tension of the band holds the top roller in its bearing grooves, supplies the traction needed to drive it with the bear steel output shaft of the motor, and allows the entire device to be picked up without it falling apart too easily.

The brushes are pieces of de-soldering braid, frayed at the end. They are held in place with blu-tack, a few pieces of which also hold the can on top of the tower. (I eventually dispensed with the extra sticks see in the photo to the left.)

The top roller is a timber stick from the same bag that supplied the wheels. This is a very poor material to make the roller core out of, but it works OK as long as the humidity is low. The surface is covered with PVC electrical tape to give the rubber-PVC triboelectric separation required. A small piece of glass tube or nylon would work better I'd imagine?

The bottom brush was left off and can be held near the bottom roller for starting the machine. It doesn't seem to be required in low humidity, I guess the motor armature and case are good enough. Grounding the motor case helps. I also found by accident that if you actually touch the surface of the belt to the bottom brush, and the brush edge to the motor casing the output jumps a huge amount. I am not really sure how to explain this, I don't think it is just "current doubling", the output change is quite large, about 8 times faster charging.

The output is feeble, but it can flash a neon bulb held about 20 millimetres away from the can once every few seconds. Sparks about 10 millimetres can be drawn to your finger tips every 20 seconds or so, they are very faint, I can't really photograph them. The short circuit current is below my best current meters response, so without building a sensitive current meter I can't tune it for better performance beyond neon flashes and spark length/pain/sound.

It does produce enough output for the classic charged thread experiments. I tried some polystyrene balls on the thread but they just bounce a few millimetres at best. I wonder if it could run an electrostatic rotary motor? I really must build one of them too, they look like a lot of fun. I'd imagine an EHT supply would kick it around quite well.

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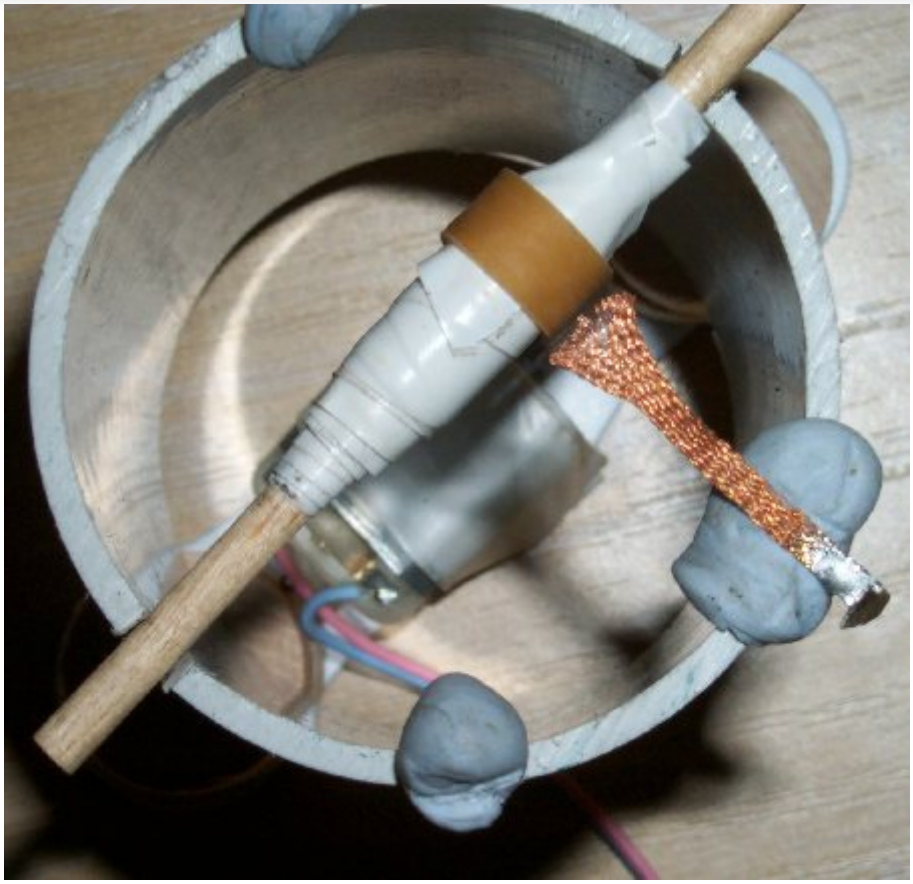
I have since built an electrostatic rotary motor, but I have not tried to power it with this project, before I do I'd like to build a neater and more permanent copy of both devices.



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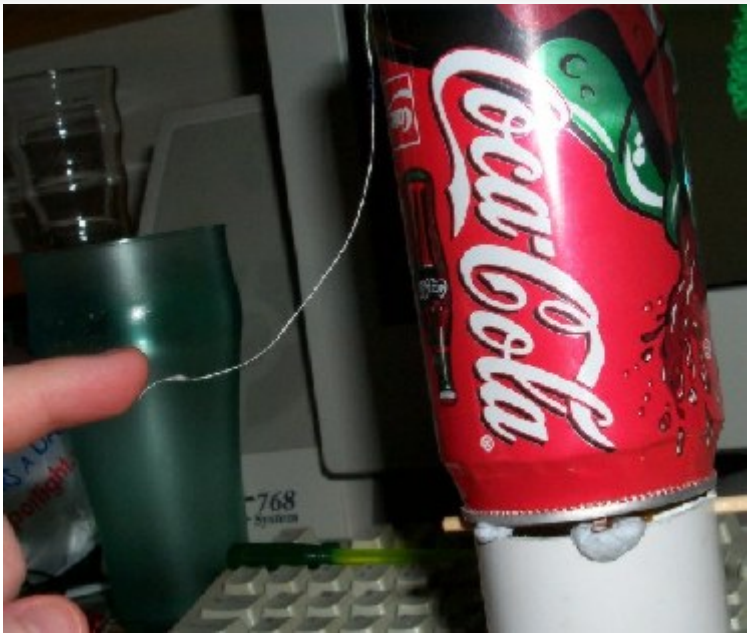

4 comments.

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